CLAIMS

1. Differential spectrophotometry process, for analysing a non-limpid medium (11), this process being characterised that:

- the non-limpid medium is lit by at least one light pulse allowing the subsequent use of the partial derivative, as a function of the wavelength, of at least one spectro-temporal transmission image acquired from the medium thus lit,

- at least one spectro-temporal transmission image, in counting mode is acquired, through at least one light collector, from the medium thus lit, allowing the subsequent use of the partial derivatives of the image as a function of the wavelength and of the flying time of the light pulse, and

- the image and its partial derivatives are processed as a function of the wavelength and of the flying time so as to acquire information about the non-limpid medium.

2. Process according to claim 1, wherein use is made, for the purpose of qualifying the degree of homogenisation of the tested medium (11) or of detecting a singularity of absorption and/or diffusion, of the partial derivatives related to variations in flying time and in spectrum of the diffusive and ergodic photons not absorbed over a wide spectral range by the medium, these

diffusive and ergodic photons being emitted by the medium while it is lit.

3. Process according to claim 1, wherein use is made conjointly of the partial derivatives related to the flying time of the light pulse and to the spectral data so as to establish a spectro-temporal identity card of the non-limpid medium (11).

4. Process according to claim 1, wherein the collector is lit without probing the medium (11) and at the same time the non-limpid medium is lit by one or more light pulses authorising derivable spectro-temporal imaging relative to the wavelength and to the time, with two peaks simulating a double beam.

5. Differential spectrophotometry device, for analysing a non-limpid medium (11), this device being characterised in that it includes:

- a pulse light source (8) to light the non-limpid medium and which allows the subsequent use of the partial derivative, as a function of the wavelength, of a spectral and temporal transmission image acquired from the medium thus lit,
- means (18) for acquiring, from the medium thus lit, a spectral and temporal transmission image, in counting mode, allowing the subsequent use of the partial derivatives of the image as a function of the wavelength and of the flying time of the light pulse, and

- means (20) for processing this image, considered as the zero order moment, and its partial derivatives as a function of the wavelength and of the time, in order to acquire information about this medium.

6. Device according to claim 5, wherein the pulse light source (8) includes means for the non-linear generation of femtosecond or picosecond light pulses allowing the use of the partial derivative as a function of the wavelength.

7. Device according to claim 5, wherein the pulse light source includes means (8) for generating and amplifying the femtosecond or picosecond or nanosecond continuum of a continuum, the continuum directly allowing the use of the partial derivative as a function of the wavelength.

8. Device according to claim 5, wherein the acquisition means (18) include a streak camera in counting mode.

9. Device according to claim 5, wherein the acquisition means include a streak camera (18) for single photoelectron counting in single stroke operational mode or in synchro-scan operational mode or in analogue mode.

10. Differential spectrophotometry process according to claim 1, allowing the establishment of a genuine

optical identity card of the volume tested, in other words a faithful signature of the statistical nature of the medium (11) relative to the more a less homogeneous contents of the diffusers and absorbers, this optical identity card being in the form of one or more spectro-temporal images that allow simultaneous access to the temporal distributions for a given spectral window, to the spectral distributions for a given interval of time, to the partial derivatives of these two distributions and to their integrals.

11. Spectrophotometry and tomography process according to claim 1, wherein use is made conjointly of the partial derivatives, with respect to wavelength, flying time and space, of the spectro-temporal images and mono-point modes with spatial scanning or commuted multi-point modes of the injection zones and/or light collection zones, the use of the space type partial derivatives then being possible and allowing certain cases of non-constant density in the volume tested to be processed, this tomography process with spectro-temporal image differentials allowing, on the one hand, an identification of a singularity of the concentration of absorbers and/or diffusers, on the other hand, a molecular identification of these absorbers, the injections and collections of light being able to be implemented either on the surface or within the volume.

12. Differential spectrophotometry process according to claim 1, wherein use is made conjointly of the partial derivatives, relative to the wavelength and the time, of spectro-temporal transmittance imaging and the counting mode by binarisation of the image then detection of a pixel zone attributable to a photoelectron and reduction of this zone to a single lit pixel, or to a sub-pixel scale, in order to increase the dynamics and qualify the single photo-electron measurement.

13. Spectrophotometry process according to claim 1, wherein use is made, for the purpose of measuring very slight variations of an absorber, of the partial derivatives in time and wavelength of the temporal queue related to the ergodic photons diffused by the medium (11) while it is lit.

14. Differential spectrophotometry process according to claim 1, wherein use is made, for the purpose of measuring or homogenising contents of absorbers and/or diffusers, of spectro-temporal imaging and the operators $\partial/\partial t$, $\partial^2/\partial t^2$, $\partial/\partial\lambda$, $\partial^2/\partial\lambda^2$, $\partial^2/\partial t\partial\lambda$ up to higher orders, these operators applying to the spectro-temporal image.

15. Differential spectrophotometry process according to claim 1, wherein use is made conjointly of fluctuations of the spectro-temporal transmittance images and the associated operators so as to carry out dynamic

opacimetry, colorimetry and particle size distribution measurements.